

# **Surf Zone Technology Concept Assessment**

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## **LONG TERM GOAL**

U.S. Navy Expeditionary Warfare strategy requires in-stride clearance in support of an amphibious assault. This need is documented in the Mission Need Statement (MNS) for Shallow Water Mine Countermeasures (SWMCM), the Operational Requirements Document (ORD) for SWMCM Mines/Obstacles, and numerous studies on littoral, amphibious, and mine warfare. Truly in-stride clearance presents a significant technical challenge. Such capability does not exist, and no system under development provides a solution. Concept Assessment addresses this challenge by surveying, evaluating, and investigating relevant technologies that may advance in-stride assault capabilities.

## **OBJECTIVES**

The specific technical objective of each concept investigated depends upon the approach and technology under study. The objectives and studies for FY98 are shown in Table 1.

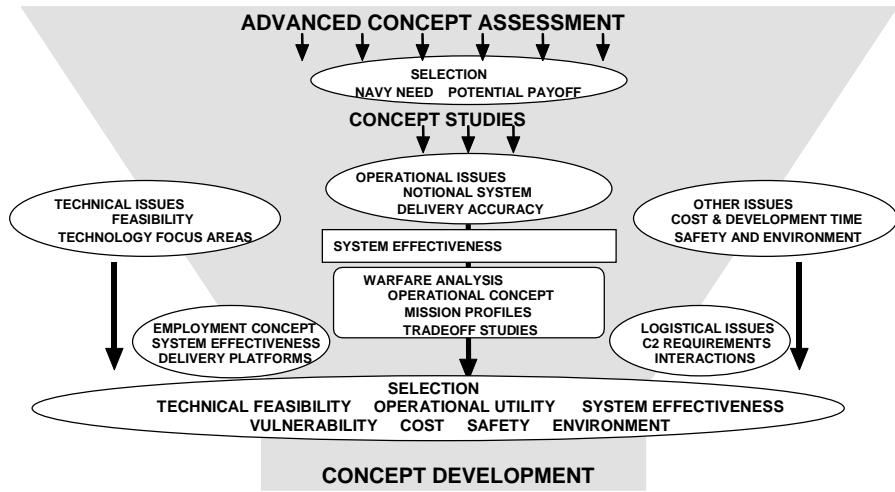
<b>OBJECTIVES</b>	<b>CONCEPT STUDY</b>
Investigate technologies to improve surveillance, reconnaissance, and navigation capabilities for the assault.	<i>BAA: Precision Assault Navigation System</i> <i>BAA: ALUV for SZ Reconnaissance</i>
Investigate concepts, which improve lethality or clearing performance of ordnance.	<i>BAA: High Energy Low Pressure Source</i> <i>Surf Zone Obstacle Clearing by Use of Smart Weapons</i> <i>Linear Shaped Charge Array Draping Study</i>
Investigate concepts to improve delivery accuracy and increase platform safety	<i>Standoff Deployment Assessment</i>
Demonstrate enabling technologies and maximize their potential payoff	<i>Foam Bridging for Surf Zone Breaching Operations</i>

*Table 1: FY98 Concept Assessment Objectives and Studies*

## **APPROACH**

Concept Assessment is performed by a repeatable selection, review, screening, and study process as shown in Figure 1.

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**Figure 1. Concept Assessment Process**

The primary reviewing body is the Advanced Concept Steering Committee (ACSC). The ACSC is a team of experts in mine warfare and related warfighting areas, originally formed by the Concept Assessment task. The ACSC meets annually to review our work. At the first screen, lesser ideas are removed from consideration. Ideas that are selected, then called Concept Studies, receive a small level of funding (less than \$100K) to determine the approach, critical technology issues, and potential technology benefits. A Warfare Analysis and System Study is performed by NSWCDD/CSS to determine the military payoff. Results of the Concept Studies are compiled and presented again to the ACSC for further review. The most promising concepts are forwarded for further demonstration with larger amounts of funding (\$100K-\$1000K).

## WORK COMPLETED AND RESULTS

### *Advanced Concept Steering Committee (ACSC)*

The ACSC convened for its third annual meeting on 11-12 August 1998 at NSWCDD/CSS. Six new concepts and seven FY98 tasks were evaluated and reviewed. It was also a rare opportunity for fleet users, OPNAV, PEO and ONR sponsors, and technology investigators to share their opinions, needs, and perspective on surf zone mine clearance and obstacle breaching. Documented results are available in Reference (1).

### *Surf Zone Technology Database*

The Surf Zone (SZ) Technology Database was created in FY96 and distributed on CD-ROM. The database is a compilation of current and past projects (including unfunded concepts) offering some capability towards solving the surf zone mine and obstacle clearance problem. The purpose of the database is to increase awareness of related efforts within DoD, improve communications across projects, identify critical technologies which can support multiple thrusts, and identify shortcomings which preclude continued or repeated funding of insupportable concepts. Response from the database was positive, but very little feedback was received from the recipients. In order to get a wider distribution the SZ Database was republished for the Internet. We plan to have this available on the Internet by end of calendar year 1998, or if public release approval is not forthcoming it will be

distributed on CD-ROM and circulated widely. We anticipate, and are actively soliciting, response from recipients of the Database in order to increase its size, scope, and accuracy. Yearly updates are anticipated.

## NAVY INVESTIGATIONS

The following three efforts were looked at by investigators at NSWC-CSS and NSWC-IHD this fiscal year and results are presented in stand-alone reports:

- Linear Shaped Charge Array Draping Study. The approach is to examine the potential and requirements for an array fabricated using linear shaped charges and strength material to defeat beach and surf zone obstacles. The initial study examines understanding how a notional array will encompass a typical line of obstacles and whether clearance using this approach would be possible.
- Surf Zone Obstacle Clearing by Use of Smart Weapons. The approach to the study is to first perform a literature search on “smart weapons”. The information obtained in the search provides the foundation for the assessment of the smart weapons, and identifies the major variables responsible for precise targeting of the smart weapon. The next step in the study is to determine the important variables for surf zone obstacles and develop a relationship between the variables for the smart weapon and the SZ obstacles. The relationship is used to determine the limitations of using smart weapons against SZ obstacles.
- Foam Bridging for Surf Zone Breaching Operations. This effort was to show the feasibility of this concept, identify any major technical hurdles with the proposed concept, and provide an initial model for analysis of the full-scale system. The approach was to develop a simple model of the floating bridge to estimate forces on the flexible sections. A scale model of the foam bridge based on the model, and simulated on the model the motion of a large load in a wave environment. As part of the concept assessment process the results of this feasibility development will be examined next year from an operational perspective and assessed against other concepts.

## BROAD AGENCY ANNOUNCEMENT AWARDS

Three Surf Zone Technology BAA (Phase I) studies were awarded in FY96 and FY97. They are *High Energy Low Pressure (HELP) Explosive Source*, awarded to SRI, International of Menlo Park, CA; *Precision Assault Navigation System (PANS)*, awarded to Lockheed Martin of Owego, NY; and *ALUV for Surf Zone Reconnaissance*, awarded to Rockwell-Boeing of Anaheim, CA. HELP, PANS, and ALUV are detailed in stand-alone reports.

## IMPACT/APPLICATIONS

Standoff delivery of bombs and delivery of ASVs in combination with Very Shallow Water Communications offer a change in paradigm for detection and clearance missions. Ordnance can be delivered from a safe standoff distance without risk to the delivery platform. Coordinated function can be provided by detonation on command without the weight penalty or complexity of lines, tethers, or connecting members. The potential exists for “nets” and “line charges” with no “strings”. Multimission ASVs offer unique flexibility for commanders of the assault to gather information, designate targets, and potentially bring force to bear in selected areas. Reconnaissance in less than 10-

foot water depths can determine the strength of previously undetected defenses or communicate real-time battle damage assessment. These needed capabilities are not currently available to the fleet.

## TRANSITIONS

Three proposed 6.4 projects have been derived from Concept Assessment technology investigations. *Precision Delivered Brute Force Surf Zone Obstacle Breaching*, and *Longstrike* (an offensive mining project) were submitted to the Pentagon as prioritized POM 00 issues, and *Small Autonomous Search Vehicles* was submitted as prioritized POM 02 project, all with support provided by PMS-407. A 6.3 Core proposal for Standoff Delivery Technology demonstration was submitted by CSS with recommendation for FY99 consideration. The VSW Communications task moved to the Surf Zone Reconnaissance Task for FY98, and will be part of a 6.3 Surf Zone Reconnaissance investigation beginning in FY99.

## RELATED PROJECTS

Surf Zone Standoff Delivery Task investigates technologies required for deployment of rockets, nets, projectiles, and bombs. The Surf Zone Target Vulnerability and Bomb Effects tasks investigate effect of explosives in the surf zone region. The Surf Zone Reconnaissance task investigates underwater vehicle and sensor performance, detection methods, communications, and swarming behavior.

DARPA ALUV, Lemmings and NAVSEA (PMS-407) SBIR for Sea Dog investigate mine and obstacle detection of smaller targets in the surf zone by autonomous vehicles.

The Marine Corps sponsored Joint Mine Detection Technology project investigates standoff location of mines, including those in the surf zone. The Marine Corps' Joint Countermeasures Advanced Technology Demonstration program investigates distributed explosive technology, mechanical neutralization, off-route smart mine clearance, and remote airborne land mine detection.

U.S.A., Natick Lab, coordinates an Advanced Concept Technology ACT II project for Deployable Wing™. Follow-on for ACT II for a powered version is under consideration.

A Magnetic Localization STTR was awarded by ONR to Foster-Miller in FY97. This Phase I investigation has relevance to the VSW Communications task, and includes participation by Correpro Atlantic.

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